

# Spider fauna of the mulberry fields at Suwon, Korea

Woon Hah Paik<sup>1)</sup> Joon Namkung<sup>2)</sup> and Hyun Jun Paik<sup>3)</sup>

## 뽕나무 밭의 거미상

백 운하<sup>1)</sup> · 남 궁 준<sup>2)</sup> · 백 현 준<sup>3)</sup>

(接受日字 1973. 2. 10)

More than 210 species of insect pests of mulberry trees are recorded from Korea. During the last 25 years many insecticides have been playing great role in plant protection as well as in the control of sanitary insect pests in the world.

Because of the adverse effects of pesticides on silkworms, chemical control of the insect pests in the mulberry fields involves difficult problems. Biological control seems to be more desirable for the mulberry insect pests.

So far only two species of insect pests were subjected to chemical control. One of the major pests, mulberry shoot gall midge, *Diplosis mori* YOKOYAMA, has been controlled successfully by the soil application of BHC in early summer. For mulberry small weevil *Baris deplanata* ROELOFS, an experiment with some insecticides was carried out during 1972 by the one of the junior author.(3)

To provide basic data for the biological of the insect pests, the authors surveyed the spider fauna of mulberry fields in 1971 and 1972 at Suwon.

Spiders were to be collected in regular intervals, at least 4 times a year, however, for some reasons, this was not possible. Consequently many young spiders could not be identified according to species.

## Materials and Methods

The size of the mulberry field 1 was 27a and the situation is shown in Fig. 1. This field was treated with BHC dust to control mulberry shoot gall midge in early April of 1971. It was divided into 9 plots that were divided into three groups according to the ecological conditions. For each plot, 10 mulberry trees were carefully examined and all spiders lodging on the the trees, were collected by the hands with aid of insect nets.

In addition to field 1, a high head prunig field was also investigated by the same method at random. Ecological conditions of the 9 plots are summarized as follows:

Plot A, B and C are located along the eastern edge a road runs along there with a street lamp (500W) near plot A. Three silk worm rearing houses are standing along the opposite side. Because of the light, these plots harbored more insects, especially mulberry pyralid, *Margaroaia pyloalis* WALKER.

Plot E, D and H are in the central part of the field and the mulberry trees are seriously damaged by the mulberry dwarf disease. Consequently the length of the shoots were a little shorter than that of the other plots.

Plots F, G and I are along the edge of the field and are along side a road or lawn.

The numbers and lengths of the shoots are shown in the following table:

Plots	A	B	C	D	E	H	F	G	I
Average No. of shoots	12	9	14	12	15	11	13	15	16
Average length of shoots	111	125	121	114	118	94	121	121	120

- 1) 서울대학교 농과대학 Coll. of Agr., Seoul Nat. Univ., Suwon
- 2) 서울특별시 청운중학교 Cheong-Un Middle School, Seoul
- 3) 농촌진흥청 잠업시험장 Sericultural Exp. Sta., O.R.D., Suwon

## Results and discussion

Results are summarized in Table 1.

A total of 4,987 specimens of spiders belonging to 17 families and 47 genera were collected during the survey. The number of species of the spiders (66) was larger than that of Abe's (1969) report<sup>1)</sup> in Japan. And the number of *Agelena* species was very small unlike Kayashiima's (1967) report<sup>2)</sup>.

According to the ecological habits of the spiders they are tentatively grouped in four and discussed separately as follows:

**Group A:** These are large species and make a large orb web. They live on flying insects and they do not seem to play an important role as a natural enemy of mulberry insect pests. Among these *Tetragnatha squamata* was dominant and 245 specimens were found from 106 trees (245/106).

**Group B:** These make a small orb web between twigs and leaves and prey on small insects trapped in the webs. In spite of the rather small body size, they seem to be the most important natural enemy. These belong to Theridiidae, Micriphantidae etc. A total of 2,815 specimens belonging to 18 species were collected. Dominant species were *Erigonidium graminicola* (924/124) belonging to Micriphantidae and *Theridion octomaculata* (566/72) and *Enoplognatha* spp. (202/83), both belonging to Theridiidae.

**Group C:** These are wandering species and prey on small insects and also seem to be a major natural enemy. Twenty six species were found among the 1727 individuals collected, of which *Misumenops* (119/74) and *Philodromus* (322/113) belonging to Thomisidae, Salticidae (91) and Clubionidae (56) were dominant.

**Group D:** These are usually wandering on the ground and very active and only 49 spiders of this type were collected six species were found. These are Lycosidae (5/60) and Pisauridae (1/4). Because of the small numbers of the yield, it is impossible to evaluate the dominant species.

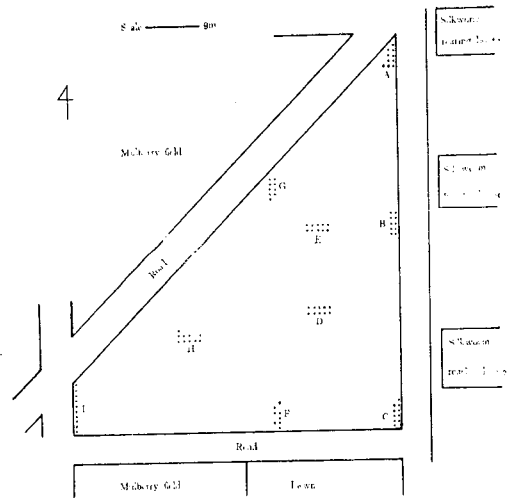


Fig. 1. Site of mulberry field 1

Table 1

	A	B	C	D	E	H	F	G	I	Total	Remarks
<b>Theridiidae 꼬마거미과</b>											
1. <i>Enoplognata transversifoveata</i> BOES. et STR.	42/12	38/12	19/10	9/6	17/6	31/11	7/6	13/9	26/11	202/83	B
2. <i>Steatoda</i> sp.	7/6	4/4	7/4	2/1	5/3	4/2	1/1	4/4	3/2	37/27	B
3. <i>Theridion octomaculatum</i> BOES. et STR.	118/4	33/4	56/9	69/8	49/8	77/10	63/10	55/10	46/7	566/72	B
4. <i>Theridion pinastri</i> L. KOCH	—	—	—	—	—	—	2/1	2/2	1/1	5/4	B
5. <i>Theridion rapulum</i> YAGINUMA 삼각점 꼬마거미	—	1/1	—	—	—	—	1/1	—	—	2/2	B
6. <i>Theridion takaense</i> SAITO	—	—	—	—	—	—	—	—	1/1	1/1	B
7. <i>Theridion tepidariorum</i> L. KOCH	1/1	—	—	—	—	—	—	—	—	1/1	B

	A	B	C	D	E	H	F	G	I	Total	
말꼬마거미											
8. <i>Theridion</i> sp.	28/13	37/10	17/5	9/8	15/8	7/7	10/8	9/6	14/7	146/72	B
9. <i>Theridion sterninotatum</i> BOES. et STR.	1/1	1/1	—	—	—	—	1/1	—	—	3/3	B
살별꼬마거미											
Total										(1964)	
<b>Nesticidae</b> 아기거미과											
10. <i>Nesticus</i> sp.	—	—	—	—	—	4/2	1/1	—	—	5/3	B
										(5)	
<b>Linyphiidae</b> 접시거미과											
11. <i>Prolinyphia</i> sp.	—	—	—	1/1	—	2/2	1/1	—	—	4/4	B
12. <i>Neolinyphia japonica</i> OI											
가시접시거미											
Total										(4)	
<b>Micryphantidae</b> 애접시거미과											
13. <i>Erigonidium graminicola</i> SUNDEVALL	432/16	132/12	77/7	137/13	168/17	173/14	226/19	204/14	137/11	1686/124	B
14. <i>Conathonarium dentatum</i> WIDER	—	—	—	1/1	—	—	4/1	—	—	5/2	B
15. <i>Gonatum opimum</i> OI	—	—	—	—	—	—	—	—	1/1	1/1	B
16. <i>Oedothorax tokyoensis</i> UYEMURA	—	12/2	10/2	48/13	24/6	34/8	11/3	1/1	13/5	153/40	B
17. <i>Scoyargus</i> sp.	—	—	—	1/1	—	—	—	—	—	1/1	B
Total										(1846)	
<b>Mimetidae</b> 해방거미과											
18. <i>Ero koreana</i> PAIK	—	—	1/1	—	—	—	1/1	—	—	2/2	B
Total										(2)	
<b>Argiopidae</b> 호랑거미과											
19. <i>Argiope</i> sp.	—	1/1	1/1	—	—	—	—	1/1	—	3/3	A
20. <i>Araneus fuscocoloratus</i> BOES. et STR.	1/1	5/4	1/1	1/1	1/1	—	1/1	4/3	3/3	17/15	A
먹왕거미											
21. <i>Araneus cornutus</i> CLERCK	1/1	—	—	—	—	—	—	—	—	1/1	A
기생왕거미											
22. <i>Araneus ventricosus</i> L.KOCH	—	—	—	—	—	—	1/1	—	—	1/1	A
산거미											
23. <i>Araneus viprifer</i> SCHENKEL	—	—	1/1	—	—	—	1/1	—	6/5	8/7	A
24. <i>Araneus</i> sp.	—	—	—	—	—	1/1	—	—	1/1	2/2	A
25. <i>Chorizopes</i> sp.	—	1/1	—	—	1/1	1/1	—	—	—	3/3	B
26. <i>Mangora</i> sp.	—	—	—	—	—	—	—	—	—	—	A
27. <i>Cyclosa octotuberculata</i> KARSCH	—	—	—	2/1	—	—	1/1	—	—	3/2	A
여덟혹먼지거미											
28. <i>Neoscona doenitzi</i> BOES. et STR	—	1/1	1/1	1/1	—	—	—	1/1	—	4/4	A
물어리왕거미											
29. <i>Nephila clavata</i> L. KOCH	—	1/1	—	—	—	—	—	—	—	1/1	A
무당거미											
Total										(3)	
<b>Tetragnthidae</b> 갈거미과											
30. <i>Leucauge subblanda</i> BOES, et STR.	—	6/2	8/3	—	3/1	—	—	—	1/1	18/7	A
포마 백금거미											

	A	B	C	D	E	H	F	G	I	Total	
31. <i>Leucauge subgemma</i> BOES. et STR. 검정 백금거미	—	—	—	—	—	—	1/1	—	—	1/1	A
32. <i>Tetragnatha squamata</i> KARSCH	33/15	39/11	33/11	19/9	10/9	27/13	19/11	40/14	25/13	245/106	A
33. <i>Tetragnatha</i> sp. Total	14/9	13/8	8/5	4/4	7/6	6/3	6/5	10/7	13/10	81/57 (345)	A
<b>Pisauridae</b> 닳거미과											
34. <i>Dolomedes hercules</i> BOES. et STR. Total	—	—	—	1/1	—	1/1	1/1	1/1	—	4/4 (4)	D
<b>Lycosidae</b> 늑대거미과											
35. <i>Pardosa asterigera</i> L. KOCH 별늑대거미	2/2	1/1	—	1/1	—	—	—	1/1	1/1	6/6	D
36. <i>Paradosa</i> sp.	1/1	—	—	—	—	—	—	4/3	—	5/4	D
37. <i>Pirata piraticus</i> CLERCK 늑산적거미	—	—	—	—	—	5/4	—	—	—	5/4	D
38. <i>Pirata procurus</i> BOES et STR	—	1/1	1/1	2/2	—	2/2	1/1	—	—	7/7	D
39. <i>Trochosa ruricola</i> DE. GEER Total	2/2	4/2	5/3	—	4/2	5/4	1/1	1/1	—	22/15 (45)	D
촌리늑대거미											
<b>Agelenidae</b> 가계거미과											
40. <i>Agelena opulenta</i> L. KOCH 애풀거미	2/2	—	—	—	—	—	—	—	1/1	3/3	A
41. <i>Coelotes</i> sp. Total	—	—	—	—	—	1/1	—	—	—	1/1 (4)	C
<b>Hahniidae</b> 외줄거미과											
42. <i>Hahnia corticicola</i> BOES et STR 외줄거미	—	—	—	—	—	—	—	—	—	—	C
<b>Oxyopidae</b> 시라소니거미과											
43. <i>Oxyopes parvus</i> PAIK 애기시라소니거미	2/1	—	—	—	—	—	—	—	—	2/1 (2)	C
<b>Thomisidae</b> 게거미과											
44. <i>Misumenops tricuspidatus</i> FABRICIUS 꽃게거미	343/6	109/13	52/9	72/4	126/11	118/4	79/9	135/10	85/8	119/74	C
45. <i>Misumenops japonicus</i> BOET. et STR. 작시꽃게거미	—	—	—	—	—	—	—	—	1/1	1/1	C
46. <i>Oxyptila</i> sp.	—	—	—	1/1	2/2	—	1/1	—	2/1	6/5	C
47. <i>Oxytate striatipes</i> L. KOCH 출연두거미	—	—	—	—	1/1	—	—	—	—	1/1	C
48. <i>Philodermus auricomus</i> L. KOCH 금새우게거미	32/13	38/14	59/14	14/9	17/11	56/13	38/12	20/12	48/15	322/113	C
49. <i>Synaema globosum japonicum</i> KARSCH 불짜게거미	1/1	—	1/1	—	—	—	—	—	—	2/2	C
50. <i>Thanatus formicinus</i> CLERCK 창게거미	—	—	—	—	—	1/1	—	—	3/2	4/3	C
51. <i>Tmarus piger</i> WALCKNAER	—	1/1	1/1	—	—	—	—	1/1	4/2	7/5	C

	A	B	C	D	E	H	F	G	I	Total	
벌레거미											
52. <i>Xystichus croceus</i> FOX	—	—	—	—	2/1	—	—	—	—	2/1	C
풀계거미											
53. <i>Xystichus</i> sp. (Y)	10/9	18/9	14/8	12/7	5/5	24/4	8/5	6/6	14/5	111/58	C
Total										(1575)	
Salticidae 강총거미과											
54. <i>Carrhotus detritus</i> BOES, et STR.	24/6	6/6	2/2	2/2	2/1	—	1/1	2/2	1/1	40/21	C
털보강총거미											
55. <i>Jotus abnormis</i> BOES. et STR.	6/4	3/3	4/3	2/2	3/2	—	2/2	1/1	—	21/17	C
점눈강총거미											
56. <i>Jotus difficilis</i> BOES. et STR.	2/2	—	—	3/2	—	—	—	—	—	5/4	C
눈강총거미											
57. <i>Myromarachne japonica</i> KARSCH	3/3	—	—	—	—	—	—	—	—	3/3	C
불개미강총거미											
58. Salticidae gen. sp.	2/2	3/2	6/4	2/2	—	2/2	2/2	1/1	4/3	22/18	C
Clubionidae 엽남거미과										(91)	
59. <i>Chiracanthium</i> sp.	1/1	—	—	—	1/1	1/1	—	—	1/1	4/4	C
60. <i>Clubiona lutescens</i> WESTRING	—	—	1/1	—	—	1/1	1/1	—	5/4	8/7	C
61. <i>Clubiona vigil</i> KARSCH	3/1	4/4	1/1	—	4/4	—	5/4	3/2	—	20/16	C
62. <i>Clubiona</i> sp. (Y)	3/3	4/1	4/2	4/3	2/2	3/3	—	2/2	2/2	24/18	C
Ctenidae 너구리거미과										(56)	
63. <i>Anahita fauna</i> KARSCH	—	—	—	—	—	—	—	—	—	—	C
너구리거미											
Gnaphosidae 수리거미과											
64. <i>Drassodes signifer</i> C.L. KOCH	—	—	—	—	—	1/1	—	—	—	1/1	C
65. <i>Drassodes</i> sp.	—	—	—	—	—	—	—	—	—	—	C
66. <i>Gnaphosa</i> sp.	—	1/1	—	—	—	—	—	—	—	1/1	C
Total no. of individual	1117	518	391	420	469	588	499	522	463	(4987)	
Total no. of species	28	29	27	26	23	36	31	26	29	(61)	

## Conclusion

Spider fauna of the mulberry fields constitute 66 species belonging to 45 genera and 17 families. The number of spiders and other species collected were rather great taking into consideration the small area and space surveyed.

With the results of this survey, it is easily supposed that spiders in mulberry fields might play an important role in the control of insect pests. Host-parasite relationships should be investigated.

## 적 요

한국의 뽕나무 해충은 210종 이상이 기록되었다. 과거 4반세기 동안 다수의 합성농약이 농림해충 및 위생해충 방제에 큰 공헌을 해 온 것은 주지의 사실이다. 그러나 뽕나무의 해충에 대해서는 농약에 대한 내약력이 가장 약한 누에에 미칠 악영향 때문에 여러가지 어려운 점이 많아서 외국에서도 잔효성이 짧은 TEPP 또는 DDVP 등이 사용되고 있을 정도이다. 한국에서도 뽕나무순혹파리 방제를 위해서 초여름에 BHC 분제의 토양처리가 실천되어 왔으며 근래에는 뽕나무에바구미의 피해가 심해져서 몇가지 살충제로 방제시험이 백<sup>3)</sup>의 해서 이루어 졌을 뿐이다. 따라서 뽕나무해충 방제를

위해서는 천적을 이용한 방제가 바람직하다 하겠다. 필자들은 우선 천적으로서의 거미의 분포 실태를 파악하기 위하여 수원시 소재 잠업시험장 뽕밭에서 1971~72년에 조사하였다. (Fig. 1)

조사된 뽕밭의 면적을 27a 이었으며 9개의 조사구를 택하고 이것을 생태적 환경에 따라 3군으로 나누어 비교해 보았다. A, B 및 C군은 동쪽 가에 위치하며 가로 등과 3개의 잠실의 등불의 영향을 받아 해충의 밀도가 높았으며 E, D 및 H군은 뽕밭의 중앙부이며 뽕나무 오갈병의 피해가 심하여 뽕나무가 작았고 또한 결주도 많았다. F, G 및 I군은 도로를 격하고 뽕밭 또는 초지에 면한 가장자리이었다.

이밖에 수시로 근처의 단 뽕밭에서 채집한 것도 포함하여 4,987마리의 거미를 조사한 바 17과·47속·66종에 이르렀다. 이것을 Abe<sup>1)</sup>의 보고와 비교할 때 종수가 월등 많았으며 또한 Kayashima<sup>2)</sup>의 보고와는 달리 풀거미속(*Agelena*) 거미가 훨씬 적은 것이 특이하였다.

채집된 거미를 그 생태에 기초하여 4군으로 나누어 천적으로서의 가치를 비교해 보면 다음과 같다.

A군: 대형의 둥근 망을 치는 종류들로서 날으는 곤충을 잡아 먹는데 천적으로서 그다지 중요하지는 않다. 106주에서 245마리가 채집되었으며(*Tetragnatha squamata*)가 우량종이었다.

B군: 소형의 둥근 망을 가지나 잎사이에 치는 종들로서 비록 몸은 작지만 가장 중요한 천적이다. 꼬마거

미과 애접시거미과에 속하는 거미들이며 18종·2,815마리가 잡혔다 우점종은 (*Erigoridium graminicola*), (*Theridion octomaculata*) (*Enoplognatha* spp.)이었다.

C군: 떠돌이거미로서 소형곤충을 잡아먹어 유력한 천적이다. 26종 1,727마리가 잡혔으며 계거미과, 깡충거미과 및 열낭거미과의 거미들이 우점종이었다.

D군: 지상을 걸어다니는 떠돌이거미로서 늑대거미과가 약간 잡혔으나 천적으로서 중요한 것으로는 생각되지 않는다. 앞으로 이들과 해충과의 관계를 조사구명해야 할 것이다.

## Literature cited

1. Abe, T. (1969): Studies on the spiders as predators of mulberry insect pests. 1. Spider species of mulberry fields. (In Japanese) Nihon Sanshi Gakkai Tohoku-shidu Koen Yoshi 23:11.
2. Kayashima, I. (1967): Study on spiders (Particularly referring to grass-spiders) to prey upon Fall-web worms (*Hyphantria cunea* DRURY). Acta Arachnologica 21(1):1-30.
3. Paik, H.J. (1972): Studies on the biology of mulberry small weevil, *Baris deplanata* ROELOFS, and its control. (In Korean) (Mimeographed) 42 pp.